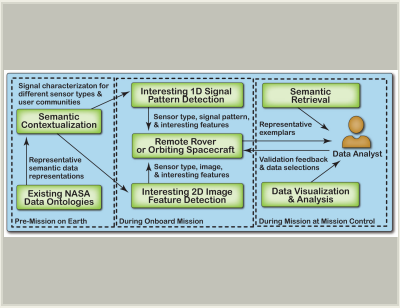
Small Business Innovation Research/Small Business Tech Transfer

DIPSARS: Discovery of Interesting Patterns and Semantic Analysis in Remote Space, Phase I

Completed Technology Project (2013 - 2013)

Project Introduction

The volume of data that NASA collects has grown dramatically as new missions come on line with hundreds of terabytes of data of all types. Often, this involves semi-autonomous exploration to collect a representative set of different scenes and objects so that research scientists and mission controllers can decide what regions are of particular interest and should be explored further. The lack of bandwidth to transmit all this data back from deep space has prompted the need to determine what data is relevant, important, and interesting enough to be sent back immediately. A common understanding among potential consumers (including the general public) of what signifies as an image or sensor reading of value is needed. To make these decisions quickly, the data needs to be presented intuitively using a common semantic vocabulary that describes interesting or anomalous features or events (e.g., composition of a certain mineral above some threshold, visual evidence of terrain features created by moving water, or a volcanic eruption in real-time during an orbital pass) so that opportunities for further inspection and analysis are not lost to long transmission times. We propose a framework for onboard intelligent data understanding algorithms to mitigate this opportunity risk and improve collection efficiency and effectiveness by summarizing the data and enabling the download of a subset containing the most valuable portions called Discovery of Interesting Patterns and Semantic Analysis in Remote Space (DIPSARS). DIPSARS is a framework for semantically characterizing, detecting, and fusing interesting and anomalous 1D sensor measurements and 2D imagery onboard remote spacecraft and planetary rovers to conserve transmission bandwidth. We do this by summarizing data events so that mission controllers and research scientists can analyze representative feature data and provide instructive feedback to seize emergent opportunities for data collection.



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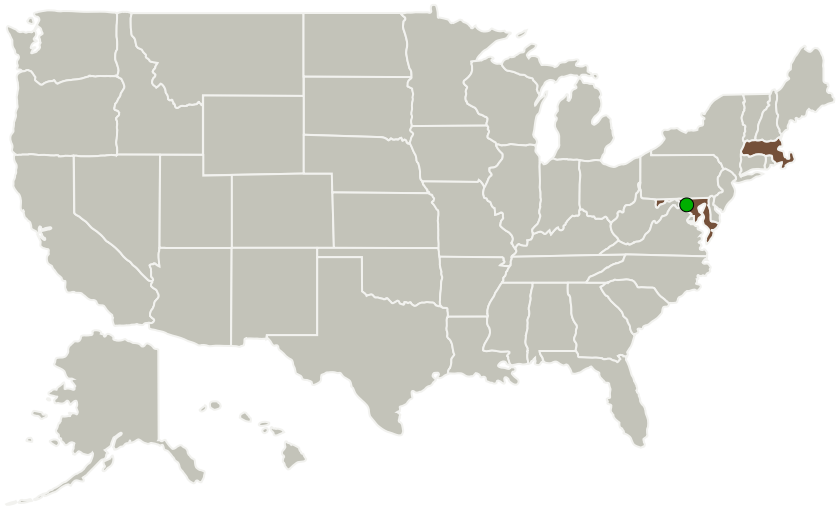
Primary U.S. Work Locations and Key Partners



Organizations Performing Work	Role	Type	Location
Charles River Analytics Inc.	Lead Organization	Industry	Cambridge, Massachusetts
Goddard Space Flight Center(GSFC)	Supporting Organization	NASA Center	Greenbelt, Maryland

Primary U.S. Work Locations	
Maryland	Massachusetts

Project Transitions

May 2013: Project Start

December 2013: Closed out

Closeout Documentation:

- Final Summary Chart*(https://techport.nasa.gov/file/138099)*

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

Charles River Analytics Inc.

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

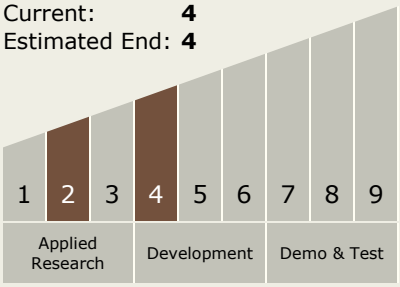
Carlos Torrez

Principal Investigator:

Daniel W Stouch

Technology Maturity (TRL)

Start: **2**
Current: **4**
Estimated End: **4**



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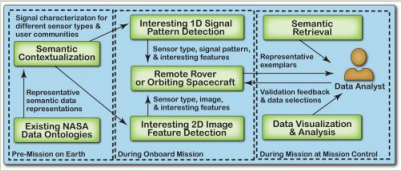
Images



Project Image
DIPSARS: Discovery of Interesting Patterns and Semantic Analysis in Remote Space
(https://techport.nasa.gov/image/128851)

Technology Areas

Primary:

- TX11 Software, Modeling, Simulation, and Information Processing
  - TX11.4 Information Processing
    - TX11.4.2 Intelligent Data Understanding

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System